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In re application of: Uwe Hansmann et al.

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SUBMISSION OF PRIORITY DOCUMENT

Sir:

Enclosed herewith is a certified copy of European Application No. 01102210.0 filed January 31, 2001, in support of applicant's claim to priority under 35 U.S.C. 119.

Respectfully submitted,

Derek S. Jennings
Reg. Patent Agent/Engineer
Reg. No. 41,473
(914) 945-2144

IBM CORPORATION
Intellectual Property Law Dept.
P. O. Box 218
Yorktown Heights, N. Y. 10598

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The attached documents are exact copies of the European patent application described on the following page, as originally filed.

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Patentanmeldung Nr. | Patent application No. | Demande de brevet n°

01102210.0

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Blatt 2 der Bescheinigung
Sheet 2 of the certificate
Page 2 de l'attestation

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Demande n°: 01102210.0

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International Business Machines Corporation
Armond, NY 10504
UNITED STATES OF AMERICA

Bezeichnung der Erfindung
Title of the invention
Titre de l'invention:
Mobile devices-power server

In Anspruch genommene Priorität(en) / Priority(ies) claimed / Priorité(s) revendiquée(s)

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Contracting states designated at date of filing: AT/BE/CH/CY/DE/DK/ES/FI/FR/GB/GR/IE/IT/LI/LU/MC/NL/PT/SE/TR
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Bemerkungen
Remarks
Remarques

D E S C R I P T I O N

Mobile devices-power server

The present invention is related to a mobile device (power supplying device) having a mobile devices-power server (MD-PS) for providing power to another mobile device (power receiving device).

Many mobile devices, like handheld computers, cellular phones or personal digital assistants, have a power sub-system & battery charger. The power sub-system & battery charger provides the required power for the operation of the components of the mobile device, e.g. display, processor, memory. The power subsystem & battery charger is provided with power from an external power supply when the mobile device is connected with an external power supply.

The use of an external power supply for a mobile device requires a device-specific power supply adapter normally provided with the device. The power supply adapter receives an ACV (alternate current voltage) and converts it into a VDC (direct current) required by the sub-system & battery charger of the mobile device.

Traveling with different types of mobile devices requires for each mobile device its own device specific power supply adapter. Taking into consideration that sockets of external power supplies are not internationally standardized an additional country - specific external power supply adapter for each mobile device is required.

US Patent No. 5578875 discloses an alternative power supply apparatus for use in connection with systems having a base unit connected to an external power supply and an associated battery-powered portable unit. The alternative power supply apparatus includes two rechargeable batteries one of which serves to

provide electrical power to the portable unit.
There are two ports associated with the base unit, each port operably and detachably accepts one of the two rechargeable batteries. The apparatus further includes a voltage regulator which provides regulated voltage to circuitry in the base unit. Two current sources each associated with a respective one of the two ports provides an electrical current to the batteries when they are operable accepted by the ports. The second rechargeable battery, which is interchangeable with the first battery, provides a source voltage to the voltage regulator upon failure of the external power supply. The teaching of that US patent does not address how providing power to several mobile devices concurrently by avoiding the use of a device-specific power supply adapter for each mobile device.

It is therefore object of the present invention to provide a new device for providing power to mobile devices avoiding unnecessary plug connections.

It is further object of the present invention to provide a new device for providing power to several mobile devices concurrently avoiding the use of an own device-specific power supply adapter for each mobile device.

It is further object of the present invention to provide a new device for providing power from one mobile device to another one in the case no external power supply is available.

Finally it is object of the present invention to provide a new system for providing power to several mobile devices concurrently avoiding unnecessary device-specific as well as country-specific power supply adapter.

These objects have been solved by the feature of the independent claims. Further preferred embodiments are laid down in the dependent claims.

The present invention discloses a mobile device (power supplying device) having a mobile device - power server (MD-PS) for providing power to another mobile device (power receiving device) having no external power supply connection, wherein the MD-PS may be integrated into the power-supplying mobile device or may be provided as a separate portable connector usable as connection between power supplying mobile device and external power supply adapter.

The MD-PS preferably comprises a voltage regulator circuit receiving an input-voltage from an external power supply adapter, generating a reference voltage requested by the receiving mobile device and providing the reference voltage to its output port providing connection to the power receiving device.
In a preferred implementation the MD-PS further comprises a reference voltage generator and a protection circuit

Brief description of the drawings

In the following preferred implementations of the present invention are described with reference to the drawings in which

Fig.1 shows a prior art system for supplying power via the external power supply to mobile devices

Fig.2 shows a preferred implementation of the present invention integrated into a notebook

Fig.3 shows an another preferred implementation of the present invention available as a separate component connectable with a notebook

Fig.4 shows basic electronic circuitry of the MD-PS used in the present invention

Fig.5 shows a detailed implementation of the electronic

circuitry of the MD-PS which may be used in the present invention.

Fig. 1 shows a standard prior art system for providing power via an external power supply to a mobile device, e.g. notebook (12), mobile phone (10) or personal digital assistant (8). Each mobile device requires its own device-specific power supply adapter (2,4,6) for converting the power (ACV) received from the external power supply into VDC. Furthermore, each mobile device has an own power sub-system & battery charger (14) providing all components of the mobile device with the required power. Traveling with several mobile devices like mobile phone and personal assistant would require to use all those device-specific power supply adapters.

Fig.2 shows a preferred implementation of the present invention integrated into a notebook.

In this implementation the notebook is the power-supplying device. The notebook (12) is provided with external power via its belonging external power supply adapter (2). The power supply adapter (2) provides a defined VSC being requested by the power subsystem & battery charger (14) of the notebook (16). The MD-PS (16) contains for each power receiving device (8, 10) a separate voltage regulator (not shown) for providing the required VDCV1 or VDCV2. The VDC V1 and VDC V2 are provided via the corresponding serial ports to the appropriate power receiving devices (8, 10).

A further advantageous feature of the MD-PS may be that the power sub-system & battery charger of the power supplying system provides power via the connection X to the MD-PS when no external power supply is available.

Fig.3 shows a further preferred implementation of the present invention available as a separate component connectable with a notebook or the power supplying device.

V2) are generated by two independent voltage regulator circuits (18, 20). The reference voltages (VReF) for both voltage regulators (18, 20) are generated in common by a voltage reference generator (22). The reference voltage generator (22) is providing three reference voltages (VRef.a-c). Each regulator (18, 20) is provided by a reference voltage selection circuit (24, 28) finally choosing one of the provided voltages (VRef.). Since a user of a mobile device especially mobile phone is typically used to connect always the same set of mobile device (mobile phone and personal assistant), a very simple cost-effective scheme to select (multiplex) the reference voltage (VRef.) is proposed as shown in Fig.5.

Two additional circuits are complementing the regulator scheme used to protect the MD-PS from damage. These are the current sensing circuits (34, 36)and the protection circuits (30, 32).

The current sensing circuit (34, 36) is continuously measuring at the actual output current (VS). The output current measured is compared to a predefined upper current limit. In a case the limit is exceeded the current limit input Cl at the voltage regulator will be activated in consequence causing the voltage regulator to decrease the output voltage.

The protection circuit (30, 32) is used to protect the MD-PS against high voltages or statically discharges applied to VDC V1 and VDC V2 outputs.

As a very simple implementation of this circuit can be realized by clamping diodes - limiting the voltage to an upper level (typically VDC in) and to a lower voltages.

A further implementation of the present invention may be realized by providing an additional output to the power-subsystem battery charger (X - see Fig.2) for providing power to the MD-PS in a case no external power supply is available.

This after sales implementation describes a MD-PS (16) as a separate portable component being functionally identical with the MD-PS integrated into the power-suppling device as described to Fig.2.

MP-PS (16) has a serial port (C4) for the power receiving device (8) requesting VDC V1, a serial port (C5) for the power receiving device (10) requesting VDC V2, a serial port(C3) for the external power supply adapter (2) and a connection to the power supplying mobile device (12). MD-PS (16) may be built into the power supply connection between the external power supply adapter (2) and its assigned serial port (C2) of the power supplying mobile device (12).

A further advantageous feature of the present invention may realized by a power sub-system & battery charger having an additional output providing power via an additional connection to the MD-PS if no external power supply is available (not shown).

Fig. 4 shows the basic structure of an electronic circuit for a MD-PS for providing power to two power-receiving devices. As already mentioned to Fig.2 MD-PS contains for each power receiving device a separate voltage regulator (18, 20) for providing the required VDC V1 and VDC V2 to the assigned serial port (C4, C5) which may be part of the power supplying mobile device if integrated into that device or may be part of the MD-PS itself if available as separate portable component. In both implementations the power supplying mobile device or the MD-PS requires a serial port (C3) for an external power supply adapter.

Fig.5 shows a detailed implementation of the electronic circuitry of the MD-PS (16) preferably used in the present invention. The implementations as described to Fig.2 and Fig.3 can be realized by an electronic circuitry of the MD-PS as disclosed by Fig.5. Fig.5 illustrates a MD-PS (16) generating and regulating two individual output voltages (VDC V1, VDC V2) allowing support for two power receiving mobile devices. The voltages (VDC V1, VDC

The receiving mobile device is provided with power via the connection X of the power-subsystem battery charger and via the MD-PS of the supplying mobile device. Switching on or switching off of the connection X may be realized by a standard programmable hardware - switch (e.g. relay, field effect transistor). The hardware - switch can be controlled by means of specific application software installed on the supplying mobile device controlling the supply of power to the receiving mobile device. For example this implementation allows to make important phone calls with the power receiving mobile device when no external power supply neither for the supplying nor for the power receiving mobile device is available.

C L A I M S

1. Mobile data processing device (power supplying device; 8, 10) having a serial port (C 3) for connecting an external power supply characterized by a further serial port (C4, C5) for providing power to another mobile data processing device (power receiving device; 8, 10).

2. Mobile data processing device according to claim 1, wherein said further serial port (C 4, C 5) is provided with a reference voltage required by said power receiving device (8, 10).

3. Mobile data processing device according to claim 2, wherein said reference voltage is generated by mobile devices - power server (MD-PS; 16) integrated into said power supplying device.

4. Mobile data processing device according to claim 3, wherein said MD-PS (16) having an input (C 3) provided with power of a certain voltage (VDC) from said external power supply adapter (2) providing power to said power supply device, one voltage regulator (18, 20) circuit for generating a reference voltage for its assigned power receiving device and an output (C 4, C 5) for providing said generated voltage(s) (VDC V1, VDC V2) to its assigned power receiving device(s) (8, 10).

5. Mobile data processing device according to claim 4, wherein said MD-PS having a further input for providing power from said power subsystem & battery charger (14) of said power supplying device (12) and a switch for controlling supply of said power from said power subsystem & battery charger to said power receiving mobile device (8, 10).

6. Mobile data processing device according to claim 1 to 5, wherein said MD-PS further comprises a reference voltage generator (22) for providing reference voltage(s) to said voltage regulator circuity (34, 36) and a reference voltage selection circuit (24, 28) choosing said provided reference voltage.

7. Mobile data processing device according to claim 6, wherein said voltage generator (22) supports several independent voltage regulator circuities concurrently.

8. Mobile data processing device according to claim 1 to 7 , wherein said MD-PS further comprises a protection circuit (30, 32) for protection of said MD-PS against high voltages or statically discharges applied to said output(s) (VDC V1 and VDC V2).

9. Mobile data processing device according to claim 1 to 8, wherein said MD-PS comprises for each power receiving device (8, 10) an independent voltage regulator circuit (34, 36), an independent protection circuit (30, 32), and an independent output (VDC V1, VDC V2; C 4, C 5).

10. Mobile data processing device according to claim 1 to 9, wherein said power supplying device (16) is a notebook and said power receiving device (8, 10) is a mobile phone or personal assistant.

11. Portable connector comprising:

an input port (C3) for connecting an external power supply adapter for receiving external power supply

an output port (C4, C5) for connecting a power receiving device

a mobile device - power server (MD-PS; 16) comprising a

voltage regulator (18, 20) for receiving an input voltage from via said external power supply adapter, generating a reference voltage, and supplying the reference voltage to said output port.

12. Portable connector according to claim 11, wherein said MD-PS comprises a reference voltage generator (22) for providing reference voltage(s) to said voltage regulator circuity (34, 36) and a reference voltage selection circuit choosing said provided reference voltage.

13. Portable connector according to claim 11, wherein said MD-PS comprises for each power receiving device an independent voltage regulator (18, 20), an independent protection circuit (30, 32), and an independent output (VDC V1, VDC V2; C 4, C 5).

14. Portable connector according to claim 11, wherein said MD-PS further comprises a protection circuit for protecting said MD-PS against high voltages or statically discharges applied to said output(s) (VDC V1 and VDC V2).

15. Portable connector according to claim 11 to 14 used as connection between serial port of the power supplying device and external power supply adapter.

A B S T R A C T

The present invention discloses a mobile device (power supplying device) having a mobile device-power server (MD-PS) for providing power to another mobile device (power receiving device) having no external power supply connection, wherein the MD-PS may be integrated into the power-supplying mobile device or may be provided as a separate portable connector usable as connection between power supplying mobile device and external power supply adapter.

The MD-PS preferably comprises a voltage regulator circuit receiving an input-voltage from an external power supply adapter, generating a reference voltage requested by the receiving mobile device and providing the reference voltage to its output port providing connection to the power receiving device.

In a preferred implementation the MD-PS further comprises a reference voltage generator and a protection circuit (Fig.2).

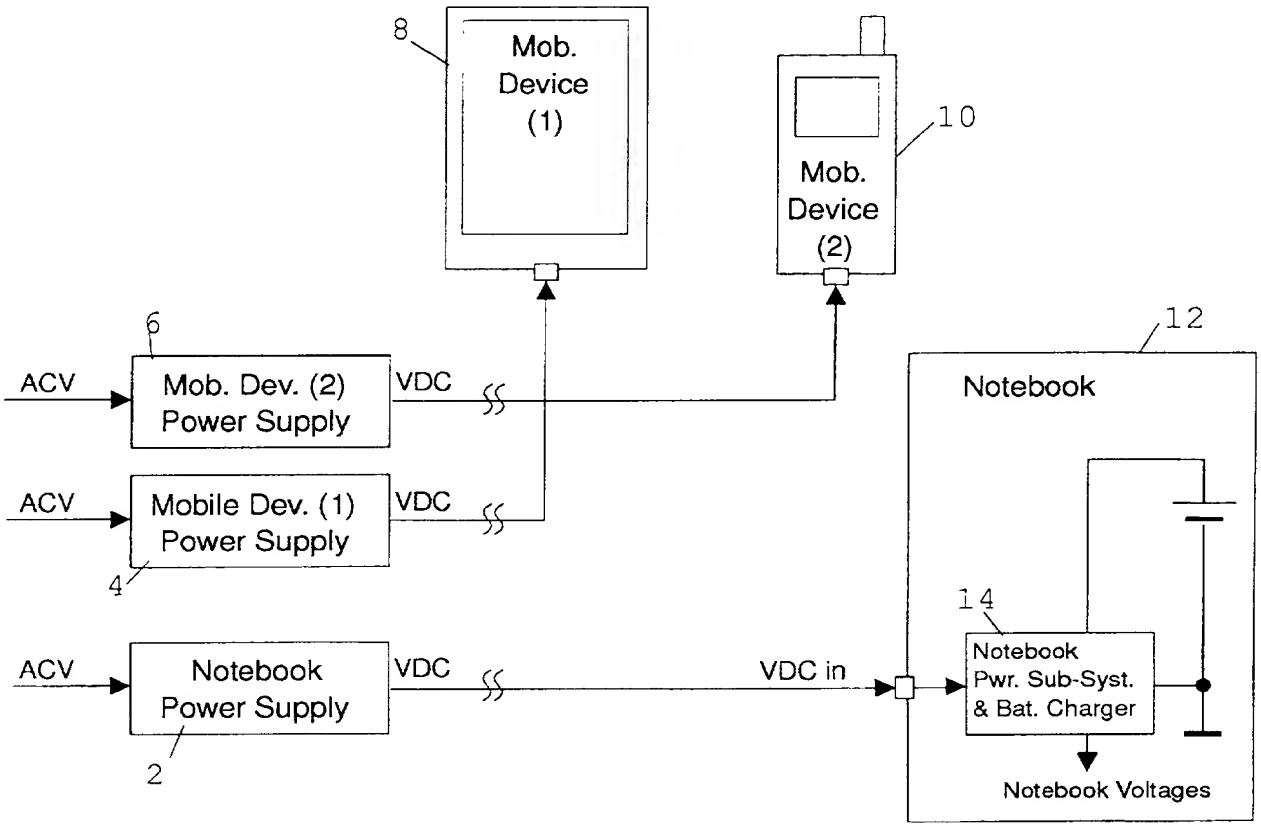

FIG. 1

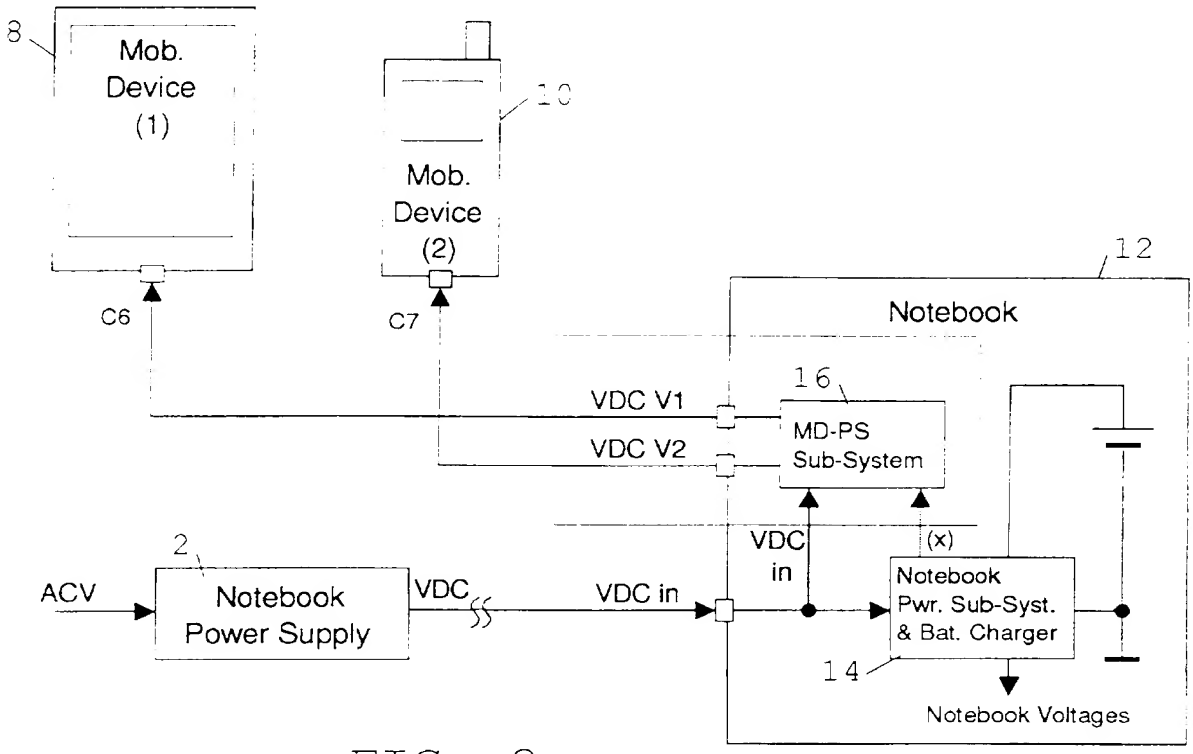
8
Mob. Device (1)
10
Mob. Device (2)
12
Notebook
C6
C7
16
VDC V1
VDC V2
MD-PS Sub-System
2
ACV
Notebook Power Supply
VDC
VDC in
VDC in
(x)
Notebook Pwr. Sub-Syst. & Bat. Charger
14
Notebook Voltages

FIG. 2

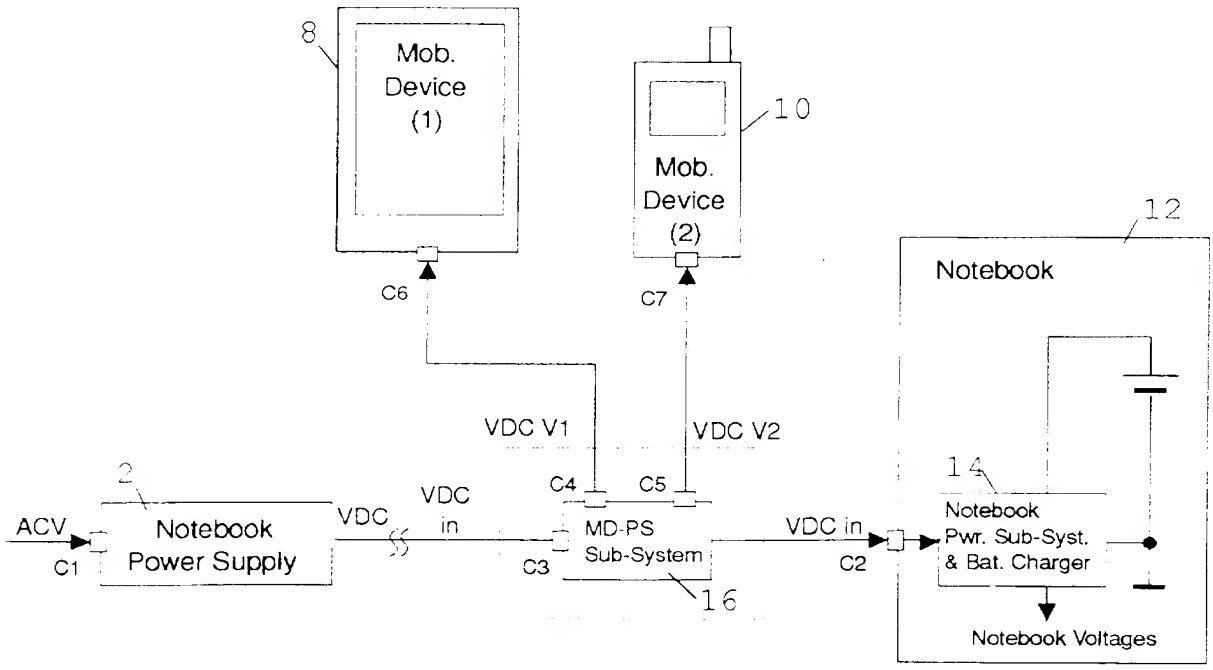
8
Mob. Device (1)
10
Mob. Device (2)
12
Notebook
C6
C7
VDC V1
VDC V2
2
ACV
C1
Notebook Power Supply
VDC
VDC in
C4
C5
C3
MD-PS Sub-System
16
VDC in
C2
14
Notebook Pwr. Sub-Syst. & Bat. Charger
Notebook Voltages

FIG. 3

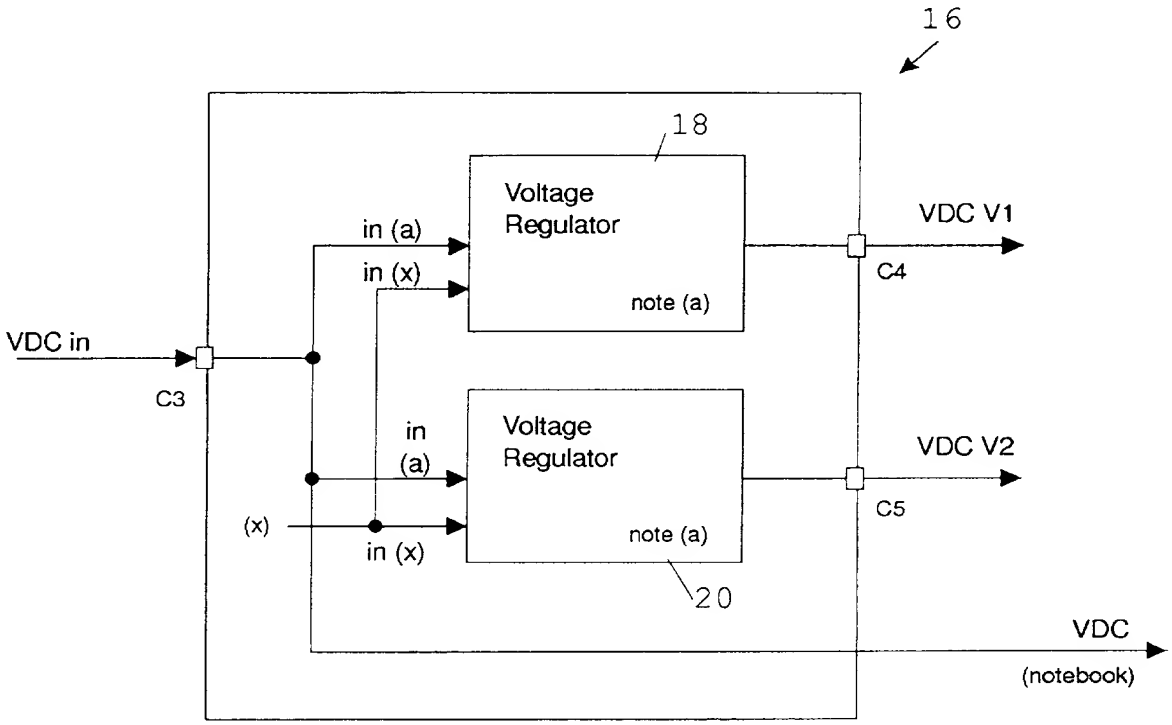
16
18
Voltage Regulator
note (a)
in (a)
in (x)
VDC V1
C4
VDC in
C3
in (a)
Voltage Regulator
note (a)
VDC V2
C5
(x)
in (x)
20
VDC
(notebook)

FIG. 4

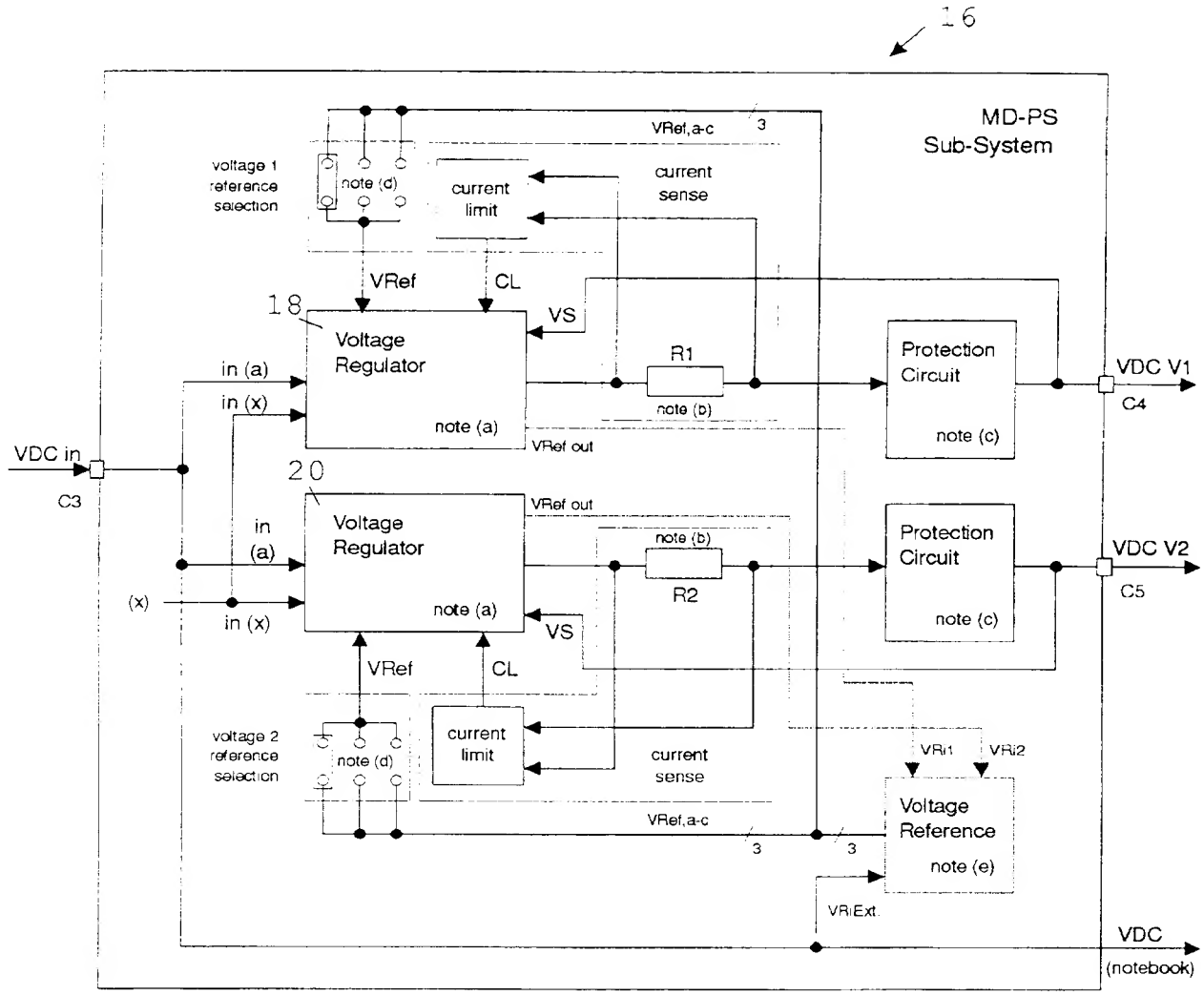
16
MD-PS
Sub-System
VRef,a-c
3
voltage 1
reference
selection
note (d)
current
limit
current
sense
VRef
CL
18
VS
Voltage
Regulator
note (a)
R1
note (b)
Protection
Circuit
note (c)
VDC V1
C4
in (a)
in (x)
VDC in
C3
VRef out
20
Voltage
Regulator
note (a)
note (b)
R2
Protection
Circuit
note (c)
VDC V2
C5
in
(a)
(x)
in (x)
VS
VRef
CL
voltage 2
reference
selection
note (d)
current
limit
current
sense
VRi1
VRi2
VRef,a-c
3
3
Voltage
Reference
note (e)
VRiExt
VDC
(notebook)

FIG. 5